

Effects of Commingling Ethanol Fuels with MTBE or Non-Oxygenated Fuels

Prepared by
Sierra Research Inc.

Sponsored by the



Background

- The Commingling Effect
 - Non-linear increase in Reid Vapor Pressure (RVP) is observed when ethanol-containing gasoline is mixed with gasoline having no ethanol in vehicle fuel tanks.
- Commingling can only be avoided if ethanol-containing gasoline is never mixed with non-ethanol gasoline.

Sierra Commingling Study

Case # 1

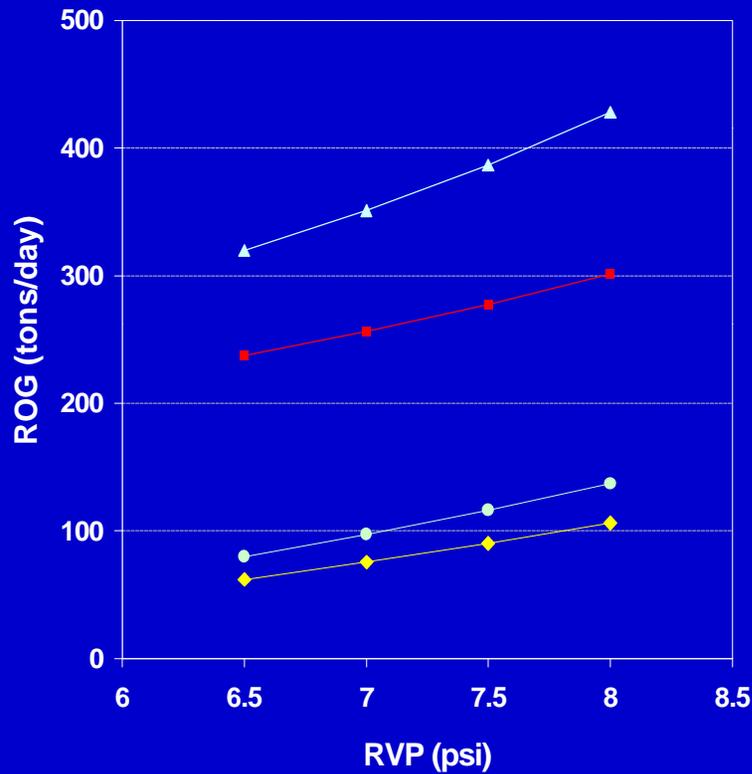
- 6.7 psi RVP Ethanol-Containing Fuels
- Ethanol at 2.0, 2.7, and 3.5 wt. % oxygen
- 6.7 psi RVP MTBE-Containing Fuels
- Future Situation in 2000

Case # 2

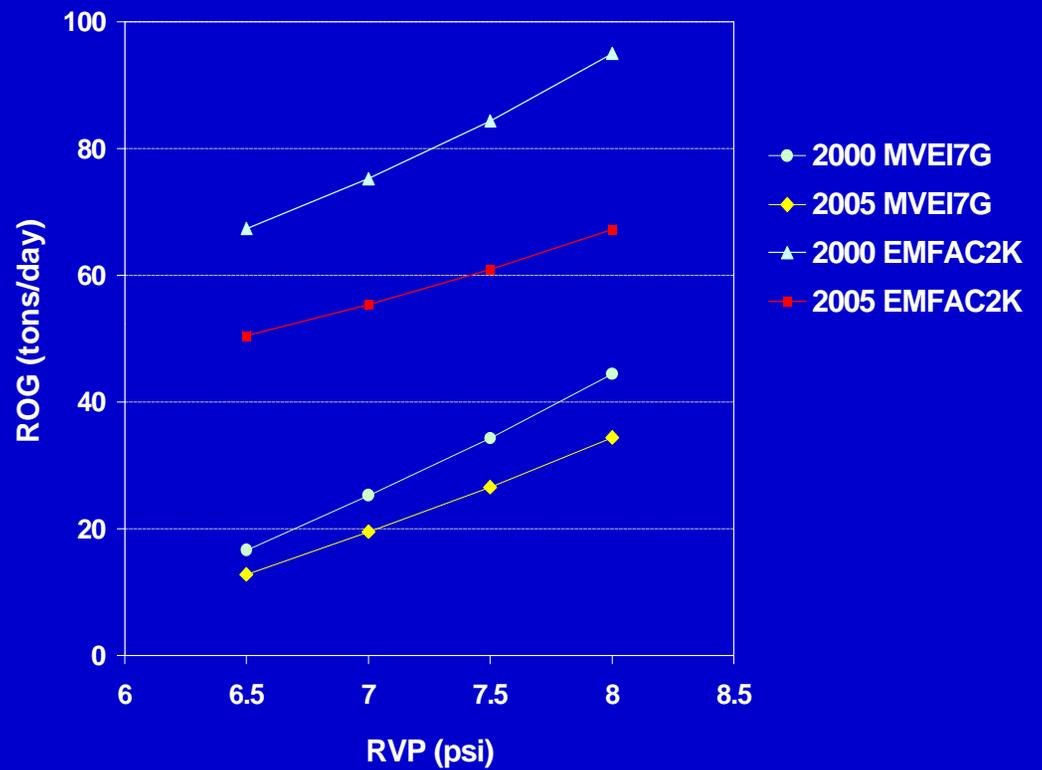
- 6.9 psi RVP Ethanol-Containing Fuels
- Ethanol at 2.0, 2.7, and 3.5 wt. % oxygen
- 6.5 psi RVP Non-Oxy Fuels
- Future Situation in 2005 if CA waived from federal oxygenate requirement

RVP - Emissions Response

South Coast Air Basin



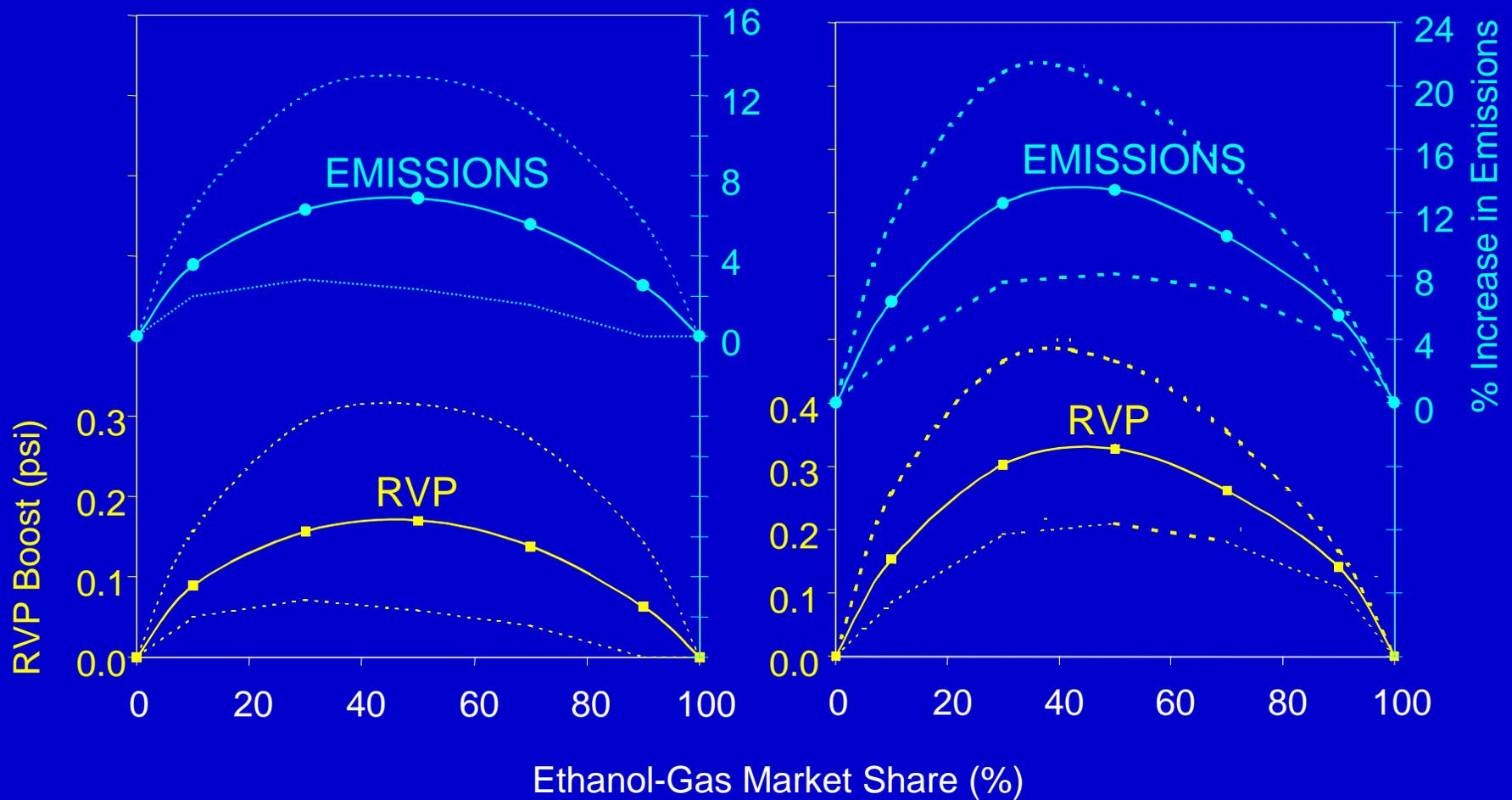
Sacramento Valley Air Basin



Results - SCAB Effects

Near Term - 2000

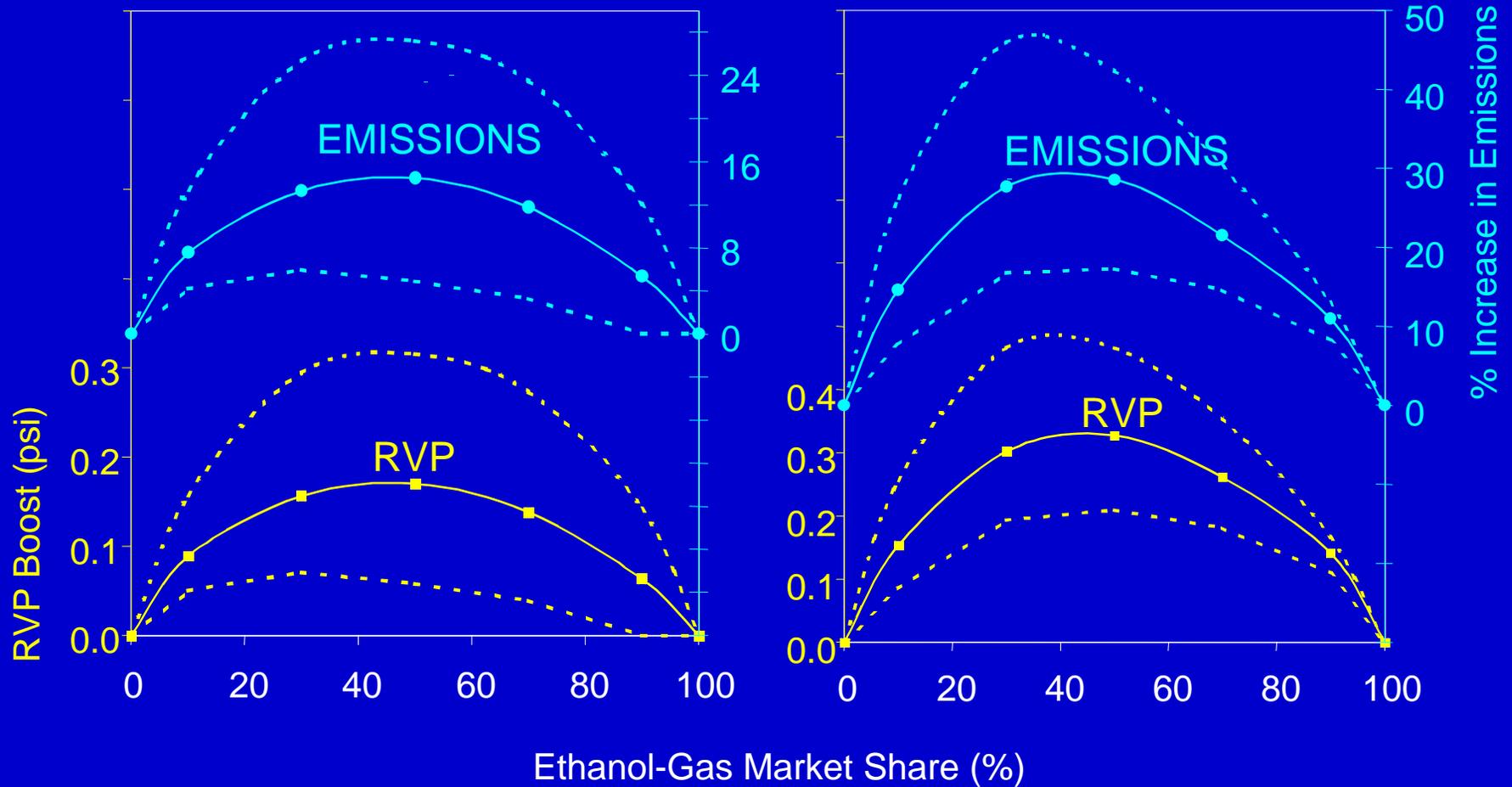
Longer Term - 2005



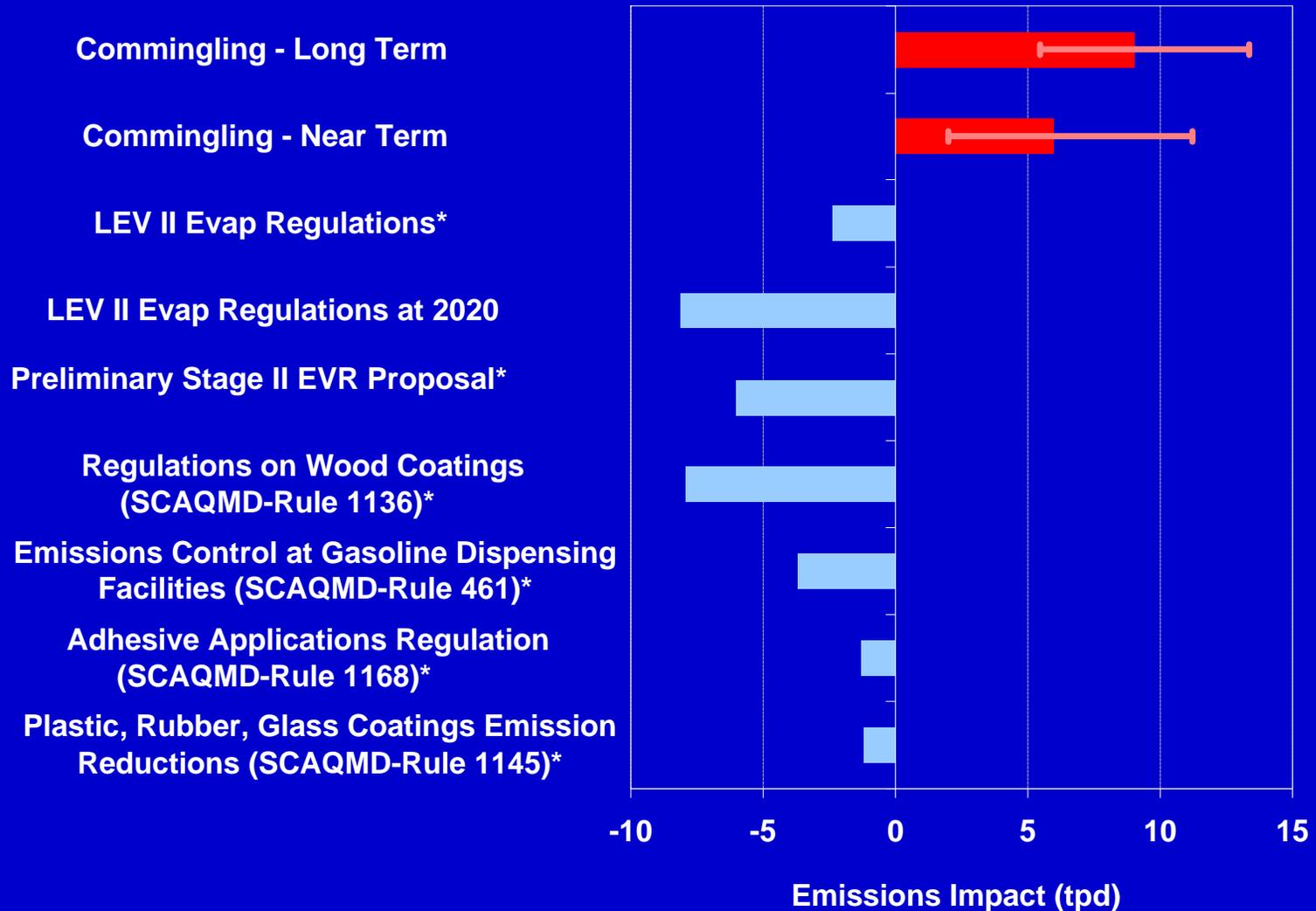
Results - SVAB Effects

Near Term - 2000

Longer Term - 2005

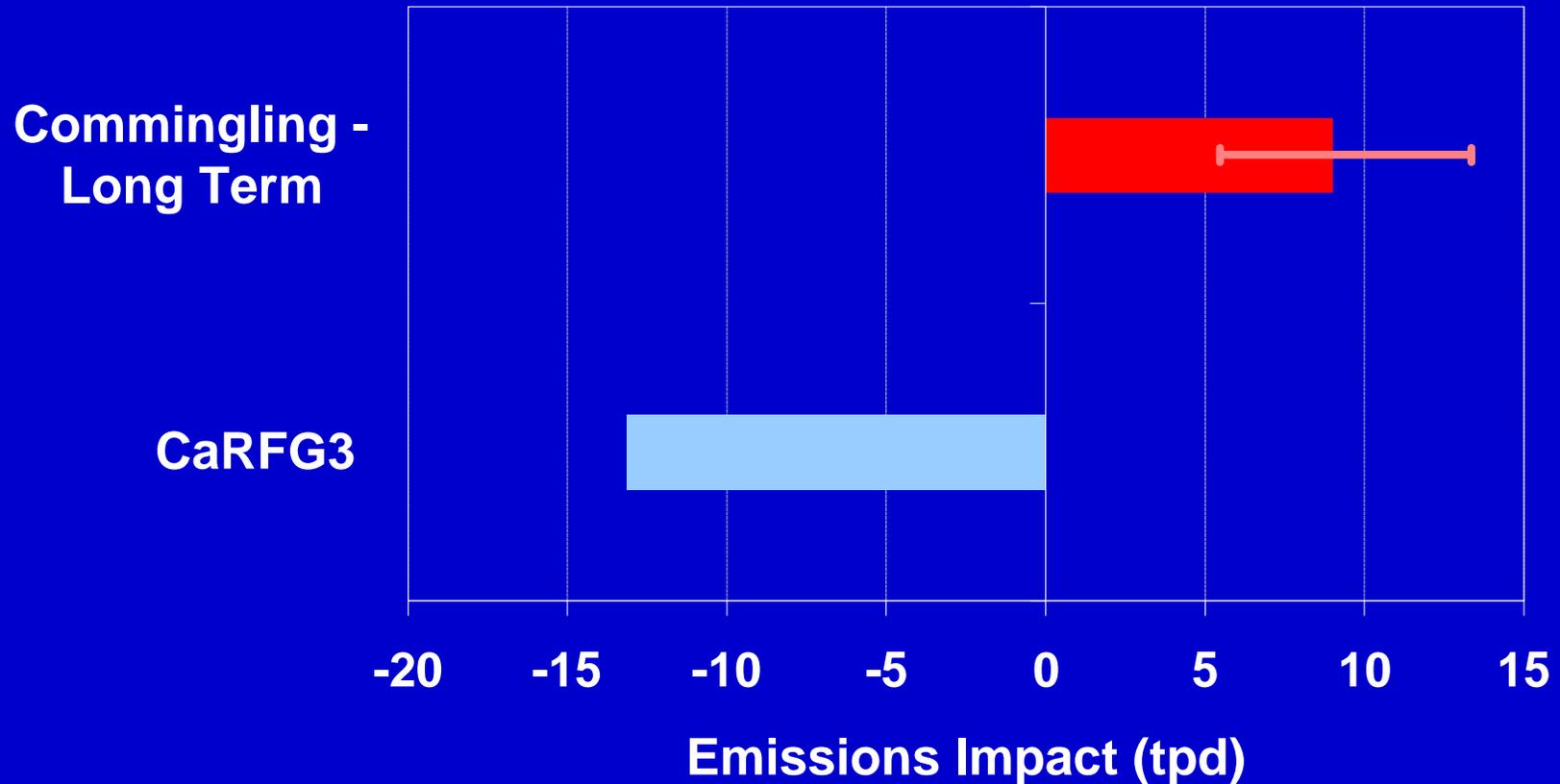


SCAB Impact Comparison



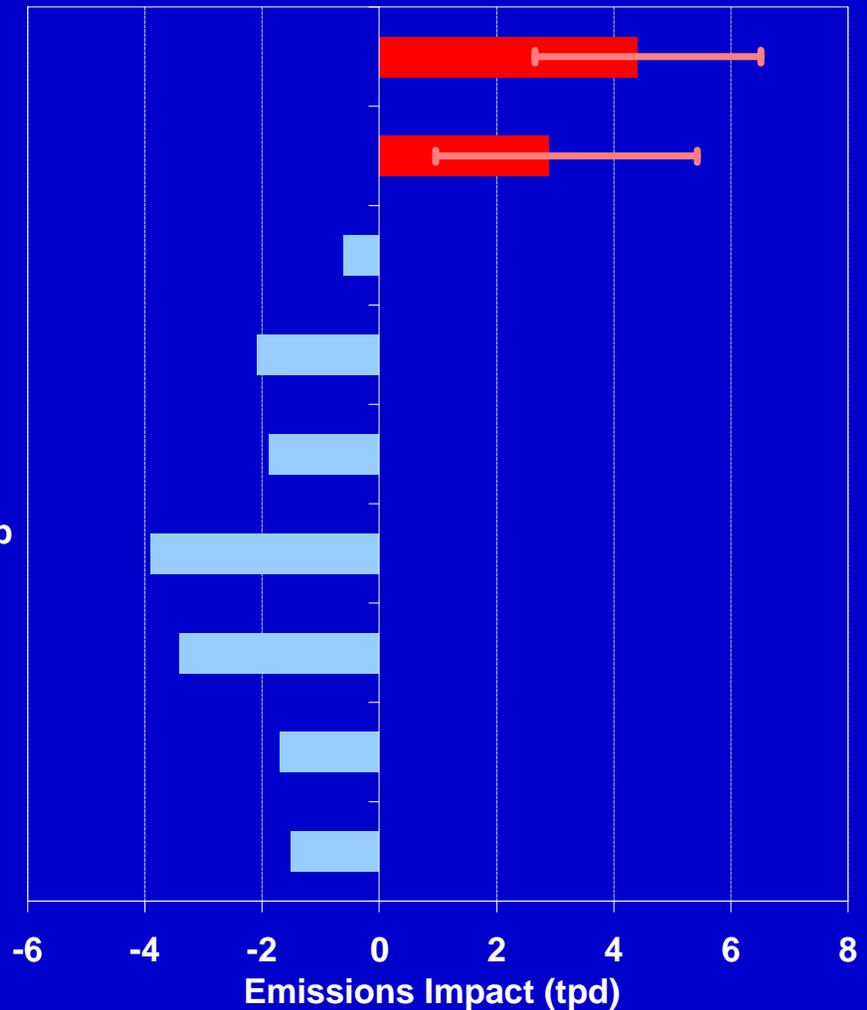
*Values depict emissions impact achieved through rule implementation in 2010.

SCAB Impact Comparison - 2005



SVAB Impact Comparison

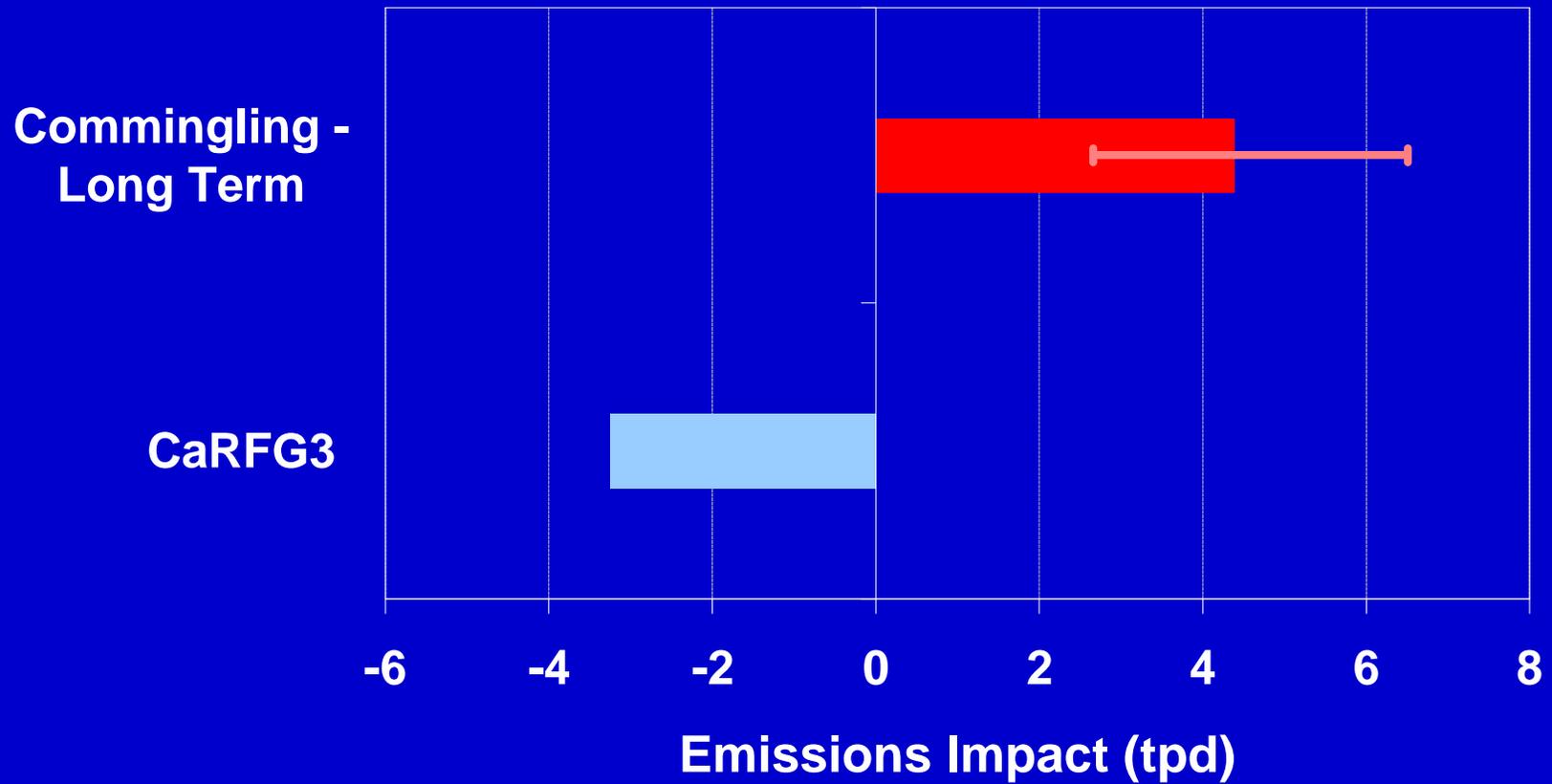
- Commingling - Long Term
- Commingling - Near Term
- LEV II Evap Regulations**
- LEV II Evap Regulations at 2020
- Preliminary Stage II EVR Proposal**
- Facilities' Surface Preparation and Clean-up Regional Measure*
- Auto Refinishing Measure*
- Architectural Coatings Regional Measure*
- Adhesives Regional Measure*



*Emission impact achieved through measure implementation in 2005.

**Values depict emissions impact achieved through rule implementation in 2010.

SVAB Impact Comparison - 2005



Conclusions

- Fuel RVP will increase as a result of commingling unless there is no ethanol used in gasoline or all gasoline contains ethanol.
- Increased evaporative emissions resulting from commingling may occur (and may have already occurred) prior to the effective date of CaRFG3, December 31, 2002.

Near-Term Solution (2000–02)

- An orderly transition to ethanol use is needed. Options are:
 - Adopt an Ethanol Control Period wherein ethanol use is banned during the summer months; or
 - Require that all gasoline contain ethanol.

Near-Term Solution (2000–02)

- This solution could be implemented on a geographical basis; e.g., in Northern California, use only fuels with ethanol, and in Southern California, use only fuels without ethanol.

Longer-Term Solution (2003+)

- In the longer term, CARB needs to complete promised studies on commingling and take appropriate regulatory action to address the issue.